

**Biological Control Concepts of IWM Strategies Youth  
Library and Activity Kit  
4W1698 MSU Index**

**Carla Hoopes  
Montana State University**

**Department of Land Resources and Environmental Sciences**

The National Invasive Species Integrated Weed Management (IWM) Library and the IWM Activity Kit prototype was demonstrated in Bozeman at the Statewide Noxious Weed Awareness and Education Campaign September 18, 2007 general membership meeting. The library contains the best of the best existing noxious weed educational publications, nationally generated curriculum, and media for public outreach. The activity kit is designed for youth groups, range camps, outdoor science exploration, and engaging discovery of what's in a kid's world. The kit allows the kid to become the scientist...a knowledgeable weed scientist. The kit engages kids in understanding the basic foundational premise of biological control as part of an integrated weed management strategy for a systems based land management plan. The kit interactively assists the kid in fun discovery of five types of biological control agents, why and where they come from, life cycles, and host specificity.

Will Harmon is a professional writer and works with the University of Montana Public Policy Research Institute when he is not writing other publications for entities such as Montana Department of Natural Resources and Conservation's TIPS for Fighting Weeds on Small Acreage in Montana. Will completed four publication updates during this reporting period. Two updates are collaborative works with Bret Olson and Carla Hoopes on the What's So Dangerous about the Impacts of Noxious Weeds on the Ecology and Economy of Montana and a new What's So Dangerous about the Impacts of Noxious Weeds on the Ecology and Economy of the Region. Will updated regional noxious weed economic impacts and added Aquatic Nuisance Species basic identification and ecological and economic impacts. Will's third update is a regional publication collaborating with the Greater Yellowstone Coordinating Committee and Amy Lerch of Teton County Wyoming Weed and Pest. The update combines regional noxious weed and Aquatic Nuisance Species impacts, and Why Should We Care about Noxious Weed information provided by researchers, biologists, curriculum committees, and educators to complete the writing for the IWM Activity Kit interactive publication "What's In Your World?" In addition to the writing for the What's In Your World? publication that is housed in a journalists' style pouch with pockets for a journal, ruler, pencil, jeweler's loop, flexible tweezers for collecting live insects, flash cards, audio track CD, and game pieces, Will wrote twenty or so interesting facts for each of six weeds listed as noxious in Montana. The interesting facts were then adapted for audio plays. Stephanie Campbell and Joel Jahnke of Montana State University Media and Theatre Arts created characters for the scripts and recorded them at Peak Recording and Sound. The recorded audio scripts serve as example of what students at camp or in a science discovery workshop could recreate from text scripts included in the kit. Tom Barrett is known as one of five voices preferred by public audiences and works for entities such as National Geographic on documentaries. Tom and Stephanie recorded the audio track of the premier publication "What's in Your World?" to enhance drive time science learning. The audio book is similar to what you would experience listening to a "Harry Potter" story about invasive weeds from a kid scientist perspective.

The CDs for interesting facts and audio plays plus the audio book is part of the National Invasive Species IWM Library. Case Logic Inc. custom designed the journalist's pouch for the age group and intended use. The durable case has zippered pocket for the journal, two separated pockets for the flash cards and the publication, an interior bag for the jeweler's loop with lanyard is tethered inside the pouch so that it is never lost. An aspirator for sucking bugs into collection canisters is also included in the kit with instructions how to identify and safely collect biological control insects. The publication was strategically developed to complement the TIPS for Fighting Weeds on Small Acreages in Montana and add the biological control concepts that are missing from the TIPS publication. The publication is turned upside down on occasion where kid scientists are guided through activities, safety cautions, and games included in the kit and library. Each engaging page leads the young student to the National Invasive Species Library where they will learn more detail about weed identification, prevention, integrating weed management strategies, seeking resources such as the county weed coordinator when they have questions, and learning what non-land managers can do when recreating on public land. Case Logic Inc. custom designed a catalog container for the companion National Invasive Species Library.

During the past four years participants met on many occasions to develop concise information about engaging youth audiences in outdoor science exploration and naturalist-type awareness of noxious weeds and what an individual can do about stopping spread. The project dove-tails and completes similar work that went into the TIPS for Fighting Weeds on Small Acreages in Montana. The audience for the TIPS publication is land managers wanting to understand the many ways there are to manage weeds. The TIPS publication leads this audience to more professional thinking before asking questions and making decisions about managing weeds. The primary content of the TIPS publication is basic noxious weed management on small acreage understanding, weed identification, inventory, and methods of management primarily chemical control, and where to find resources.

When you look into the World around you,  
pretty weeds  
are about to meet their match!

The Statewide Noxious Weed Awareness and Education Campaign is looking for youth educators to "test drive" the new "What's In Your World?" education program.

All we ask is for your willingness to attend an orientation workshop, put on a real-world field trip, use the activity kit and contribute constructive feedback by August 2008.

We'll want to know a little about you.

are you a youth organization, weed or conservation district, possibly an outdoor science school?

how many kids ages 8-14 will participate?

what is the date of your proposed outdoor field trip (must be after June 1, 2008)

That's not all!  
Are you ready  
to work with  
youth audiences  
in the great  
outdoors?



22 illustrated  
bio-control  
agents are  
ready for  
your T-shirt  
awareness  
projects.

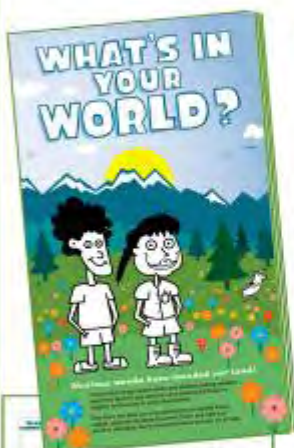
Contact choopes@montana.edu to get your "BIO" CD.  
Minimal fees apply to cover CD and shipping (\$17.50).  
Commercial vendors will be asked for a large contribution  
to support statewide noxious weed education efforts.

### DVD's and CD's

Weed Audio Plays  
with Scripts  
For Youth  
Performances

Sweeping Your World  
With An  
Insect Net  
Training  
Video

Alien Invasion  
Plants on  
the Move  
K-12  
Curriculum



24-page  
Naturalist - Weed Scientist  
Self-Paced Guide  
emphasizing  
six priority weeds  
and integrated  
methods of  
management

ADDs for the first time  
biological control concepts

BIOLOGICAL CONTROL  
FLASH CARDS



GAMES and INTERESTING FACTS  
about NOXIOUS WEEDS



CONTACT  
Carla Hoopes  
Program Coordinator  
Statewide Noxious  
Weed Awareness  
and Education  
Campaign  
for details  
406-994-5683  
choopes@montana.edu  
or log onto  
weedawareness.org

Pulling  
together  
Special Noxious Weeds

The IWM Activity Kit publication adds the biological control component to the work that brought together the TIPS publication. It is written for youth audiences, range camps, and outdoor science workshops and exploration.

Science teachers, biologists, and agency educators came together to help develop content in age appropriate context used in both the Activity Kit and the 2008 Montana Noxious Weed Education Calendar: Todd Breitenfeldt, Carol Hatfield, Mia Whitfield, Gloria Weisgerber, Marijka Wessner, Maureen Connor, Tom Barbouletos, Lis Herbertson, Alan Knudsen, Will Lanier, Jim Larson, Tonda Moon, Carol Randall, Dwight Scarbrough, Nancy Sturdevant, Kevin Suzuki, Janet Valle, Paul Wick, and Dan Williams.

Montana State University (MSU), Oregon State University (OSU, and USDA Agriculture Research Station (APHIS) researchers came together to guarantee the accuracy and appropriateness of the content: Jeff Littlefield (MSU), Eric Coombs (ODA); and Rich Hansen (APHIS).

Photographers contributed high resolution images for use in the calendar: Rich Hansen and Robert D. Richard (APHIS), K. Weller (ARS); Joe M. DiTomaso (University of California); Marc Murell; Allison Fox; Linda Wilson; Bill Reeves; Drake Barton (Montana Native Plant Society); Mary Ellen Hart; Jed Fisher (Flathead County Weed District); R. L. Johnson; US Geological Survey; Brian Ostwald (Carbon County Weed District); Monica Pokorny and Dan Gustafson (Montana State University); Eric Coombs (OSU); Montana Fish, Wildlife and Parks; Steve Dewey (Utah State University); Tammy Wang (University of California Berkeley); and Jason Goeckler (Kansas Wildlife and Parks).

New volunteers reviewed the content and provided editorial comments on more than one occasion during the review process: Larry Beneker (Bureau of Indian Affairs); Joe Merenz (APHIS Plant Protection Quarantine); Dave Burch (Montana Department of Agriculture); Justun Juelfs (Montana Department of Transportation); Dan Dobler (Montana Department of Natural Resources and Conservation); Joe Weigand (Montana Fish, Wildlife and Parks); Eileen Ryce (Montana Aquatic Nuisance Species Coordinator); Janet Clark (Center for Invasive Plant Management); Jeff Littlefield and Monica Pokorny (Montana State University); Margie Edsall (Montana Weed Control Association and Madison County Weed District); and Christina Evans (Lewis and Clark Conservation District). Mike Kippenhan is an entomologist by interest and training, and a graphic designer by profession working with new technologies at Montana State University's Creative Research Lab. We were fortunate enough to contract with him to give creative direction to the numerous and diverse input we received from all of the participants who see a critical need for this product. Mike led the project through its development to the prototype that was demonstrated on September 18 in Bozeman. Elliott Kennerson is a former copy editor for the New York Times and Masters candidate for Montana State University Science and Natural History Filmmaking program. Elliott produced educational message points in film on DVD for the National Invasive Species Library. He also filmed a public insect collection day during July in Choteau at the Buzzy Breen Insect Collection Day for the Rocky Mountain Front Weed Round Table. The film was adapted to a training video on DVD for the National Invasive Species Library to help kids better understand why and how to successfully introduce and collect insects on noxious weed infestations. Joe Merenz of USDA APHIS Plant Protection Quarantine continued to lead the overall project and coordinate with Carla Hoopes and Janet Valle of the State and Private Forestry Regions 1 and 4. Joe and Gary Adams coordinated funding through USDA Animal and Plant Health Inspection Service Plant Protection Quarantine cooperative

cost-share program administered by the Montana Department of Agriculture. The funding was provided to produce the flash cards that are a premier component of the IWM Activity Kit and National Invasive Species Library.

### ***Problems Encountered***

Some delay was encountered when we were asked by Dave Burch of the Montana Department of Agriculture (MDA) and Marijka Wessner of the Montana Weed Control Association Education Committee in fall 2006 to stop work and wait for the Missoula County Weed District Know Weeds Curriculum project to catch up with the IWM Activity Kit project. Dave Burch informed us that MDA would not extend the grant period for the IWM Activity Kit project beyond September 30, 2007.

Once we received confirmation that project deadline would not be extended even though we were asked to wait for the Know Weeds curriculum project to catch up, we resumed work on the project with approval from Dave Burch. The Know Weeds curriculum developer, Sarah Millar, resigned her job in spring 2007 and the new curriculum coordinator was still not hired by September 18 when we demonstrated the kit. We anticipate that the two projects will nicely complement each other and Carla Hoopes will continue to serve on the Know Weeds project advisory committee.

### ***Evaluation of Success: (Report on steps taken to evaluate the success of the project, include photos)***

Success is measured by three means: 1) the number of youth leaders willing to test this product; 2) new participants in the distribution of the kits; and, 3) new diverse funding resources for weed education products.

At the September 18, 2007 demonstration of the prototype, six youth educators volunteered to preview the IWM Activity Kit and respond within ten days with comments. Their comments were included in the final version of the "What's in Your World?" publication, the premier product that accompanies the National Invasive Species IWM Library. The complete product will be distributed to Todd Breitenfeldt and biological control insectary program educators in Montana and Idaho to test the products in their science programs. Melissa Griffiths and the Madison Valley Ranchlands Group, and the Greater Yellowstone Coordinating Committee Weed Subcommittee will engage their youth educators in testing the Kit. We anticipate five hundred youth educators from agencies, local organizations, watershed and stakeholder groups will test market the product. Each youth educator will receive a National Invasive Species IWM Library and Journalist's pouch with as many "What's In Your World" publications as they have youth in their program.

The second measure of success is new participants in the distribution of the kits. After the September 18 demonstration, Lindy Garner and the US Fish and Wildlife Service indicated that they will sponsor a Region 6 challenge cost-share agreement proposal to help meet their noxious weed education goal of getting youth back outside learning and caring for the environment. Jim Olivarez indicated that this product also meets US Forest Service noxious weed educational goals and overall Forest Service goals to get kids camping again. US Fish and Wildlife Service challenge cost-share proposal is expected to cover the production cost of the library container and journalist's pouches.

The third measure of success is new diverse funding resources for weed education products. The pouch is designed for the kid to use to explore the world around them, learn how to identify noxious weeds, and how to identify and collect biological control insects ... all the while taking notes in the journal and referring to the National Invasive Species IWM Library as

directed by the "What's in Your World?" publication. The pouch contains biological control flash cards that were developed under a matching grant by the USDA APHIS Plant Protection Quarantine. The pouch also contains a journal, pencil, ruler, flexible tweezers, jeweler's loop in a bag tethered inside the pouch, and aspirator that will be provided by the Whitehall Biological Noxious Weed Control Project.

Each of the components to the kit is funded by a different sponsor. Contributors to the National Invasive Species IWM Library are as follows: Aquatic Nuisance Species Task Force, California Invasive Plant Council, Center for Invasive Plant Management, Federal Interagency Committee for Management of Noxious and Exotic Weeds, Greater Yellowstone Coordinating Committee Weed Subcommittee, Lewis and Clark Conservation District, Lewis and Clark Interpretive Center, Madison Valley Ranchlands Group, Montana Association of Conservation Districts, Montana Stockgrowers Association, Association of Grazing Districts, Montana Trail Vehicle Riders Association, Montana County Weed Districts, Montana Department of Agriculture, Montana Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, Montana Department of Transportation, Montana Farm Bureau Federation, Montana Native Plant Society, Montana State University College of Agriculture Departments of Land Resources and Environmental Sciences, Seed Testing Lab, and 4-H Foundation, Montana State University College of Arts and Architecture Departments of Media and Theatre Arts, KSUM TV / Montana PBS, Science and Natural History Filmmaking, and MSU Extension Service, National Invasive Species Council, National Off-Highway Vehicle Conservation Council, University of Nevada Cooperative Extension, Oregon Department of Agriculture, Ponderosa Snow Warriors, Rocky Mountain Elk Foundation, Rocky Mountain Front Weed Round Table, Salmon-Challis National Forest, The Nature Conservancy, Townsend Schools Bugs and Weeds Project, USDA Animal and Health Inspection Service Plant Protection Quarantine, Forest Service Northern Region and State and Private Forestry, Natural Resources Conservation Service, Geological Survey, USDI Army Corps of Engineers, Bureau of Indian Affairs, Bureau of Land Management, Bureau of Reclamation, Fish and Wildlife Service, Partners for Fish and Wildlife, National Park Service, University of Montana Public Policy Research Institute, Western Area Weed Council, Whitehall Biological Noxious Weed Control Project, and Wyoming Weed and Pest.

***Activities for the Next Reporting Period: (Include acres to be treated/grazed, biocontrol releases, meetings, etc.)*** Product tests by youth educators during the coming year will provide feedback to the final production of the product and an annotated version of the premier publication "What's in Your World?"

A distribution list will be confirmed and orders for kits and libraries will be secured. Six youth educators and county weed district education coordinators will meet to discuss project coordination and costs in order to develop a strategy for sustaining this project once the initial phase of testing is complete.

It is anticipated that contributions secured through future orders from youth educators will allow this project to become self-sustainable.

The flash cards are going through their final edit at the time of this report. Printer bids are solicited. The printed cards will be assembled into the Journalist's Weed Scientist pouches during this period and complete by the project end date December 30, 2007.



**Final Report**  
**Project Title: Biological Control of Field Bindweed Survey**  
**Cooperator Name: Jeffrey Littlefield - Montana State University**  
**Agreement # 07-8572-0810-CA**

**Introduction:**

Field bindweed, *Convolvulus arvensis* L. (Convolvulaceae) is one of the most aggressive, perennial weeds of grain producing areas of the northern Great Plains of North America. Although field bindweed is a persistent weed of croplands, it also occurs in pastures, gardens, roadsides, right-a-ways and vacant land. Field bindweed has been identified as a target species for biological control by APHIS. To control this weed biologically, the gall mite, *Aceria malherbae* Nuzzaci (Acari: Eriophyidae) (one of only two agents approved by APHIS for field release) has been released in the United States. Although the mite has been successfully established at three locations in Montana, the establishment and spread of the mite at other sites is not currently known. Successful biological control would provide an alternative management strategy for field bindweed.



Field bindweed infestation in a hay field near Huntley, MT.

## Plan of Action:

Objective - Previous release sites of *Aceria malherbae* will be inspected for successful establishment of the mite.

Approach - Sites of *Aceria malherbae* were inspected from mid-August to mid-September. Percent mite infestation was determined at each site (see below). If mite galls were observed, visual inspections of adjacent field bindweed infestations were made parallel and perpendicular to the prevailing winds until mites or field bindweed could no longer be located. A more general survey along major roads was also conducted in eastern Montana.



USDA ARS photo archives, Bugwood.org  
An adult field bindweed mite, magnified.

Microhabitats at selected *Aceria malherbae* release sites were characterized as to site/environmental conditions, plant productivity, soil conditions, and current or past land utilization. Sites were characterized as to elevation, aspect, average precipitation, and mean temperatures (if available). Field bindweed density, plant composition, percent cover and biomass were estimated for each sampling unit. Ten 1/4 m<sup>2</sup> quadrates were sampled along a 50 m transect extending through the center of the release site. From these quadrates, field bindweed density (i.e. number of stems) and number of infested stems were determined, and all plant material was clipped, bagged, and dried to determine biomass (g). Plants were separated as to field bindweed, grasses and forbs to determine species composition. Percent cover at each sampling unit was visually estimated. Physical properties and nutrient quality of the soil were also determined. Soil compaction was measured using bulk density estimates. Soil from upper horizon (A) was sampled using a manual soil corer. Two representative samples were collected from each site and combined and sub-sampled for soil analysis: % organic matter, sand, silt and clay, soluble salts, pH, and various minerals/micronutrients. All laboratory work, with the exception of the soil analyses, was conducted on the MSU campus.

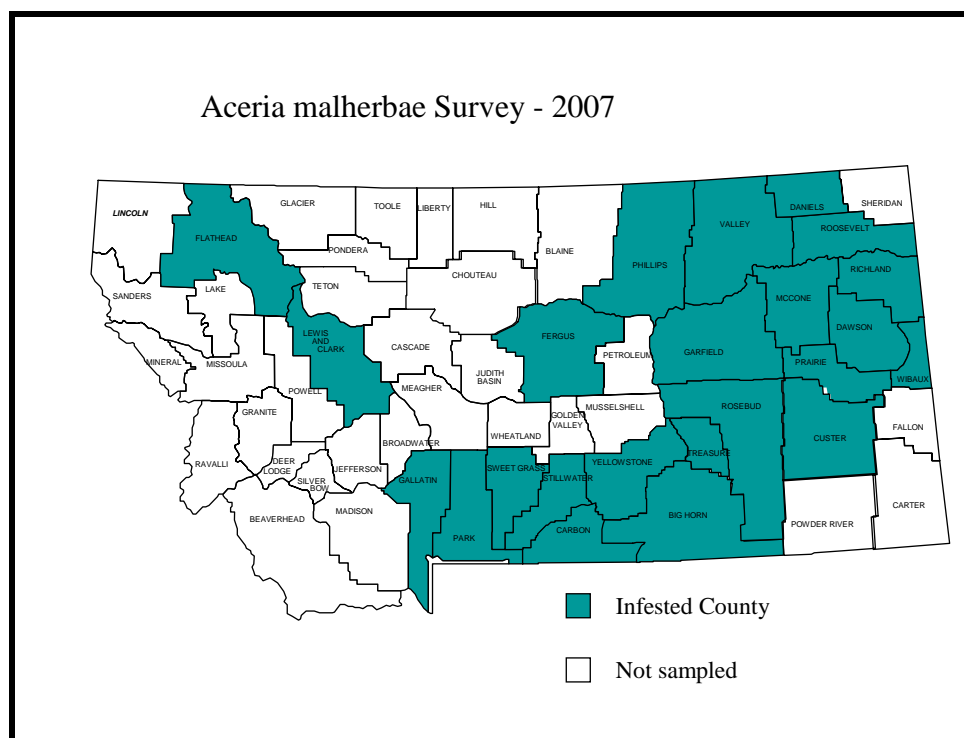


## Results:

Geographic Location In Which The Project Took Place - The geographic range of the survey was expanded to include the following Montana counties: Big Horn, Carbon, Custer, Daniels, Dawson, Fergus, Flathead, Gallatin, Garfield, Lewis & Clark, McCone, Park, Phillips, Prairie, Richland, Roosevelt, Rosebud, Stillwater, Sweetgrass, Treasure, Valley, Wibaux, and Yellowstone (Table 1). Due to budget and time restrictions surveys were not conducted in Hill, Judith Basin, and Teton Counties. Except for Teton County, these releases were made in 2006 and therefore were of lower priority.

Previous releases of the mite occurred in Fergus, Flathead, Gallatin, Hill, Judith Basin, Lewis & Clark, McCone, Park, Phillips, Richland, Roosevelt, Teton, and Yellowstone. Infested field bindweed sites were located at all of these counties (Hill, Judith Basin and Teton not sampled), although not all sites had the mite present.

The remaining counties- Big Horn, Carbon, Custer, Daniels, Dawson, Garfield, Prairie, Rosebud, Stillwater, Sweetgrass, Treasure, Valley, and Wibaux - represent counties where the mite was not known to previously occur.



Mite populations tended to be quite variable. Most field bindweed sites in eastern Montana were infested with mites. In general only a few plants were infested at each site, but occasionally heavy pockets of the mites were observed, e.g. sites near Vida (McCone Co.) or Opheim (Valley Co.). Many of the sites visited in Yellowstone Co. had significant infestations of *Aceria malherbae*. In contrast, sites located in the western portions of the state (e.g., Flathead, Gallatin, Lewis & Clark and Park Counties) had low levels of infestations despite the mites being established for a period of ten years at some sites (i.e. Flathead and Gallatin Counties). At these

sites only an occasional plant was infested, with only one or two leaf galls observed. These sites occur at relatively higher elevations and receive more rainfall.

The majority of the sites sampled were along roadsides or vacant land, where disturbance (other than mowing) is minimal. Mites were also located in highly disturbed sites such as hay land, pastures and cultivated/ fallow fields. Plant cover at infested sites was characterized by moderate grass cover or open ground. Bindweed cover ranged from 6-25% and the presence of other forbs was low (less than 5%). Infested sites were generally more open and drier habitats. Soil conditions at high verses low mite infestations did not vary greatly. Soil texture was thought to be a key characteristic in the ability of the mite to overwinter, but the soil texture ranged from sandy loams to heavy clay soils; and reflected more the location of the particular site.

### Conclusions:



Young leaves of field bindweed galled and twisted by the field bindweed gall mite.

*Aceria malherbae* is well established within the state of Montana. Although many counties were not sampled, the mite appears to be widespread in eastern portions of the state. It is thought that the mite has a wider distribution than what is indicated by the survey. The mite may have also dispersed into surrounding states such as North Dakota and Wyoming, or the Canadian province of Saskatchewan. The sources of the mite are not known. Although releases were made in the eastern part of the state (e.g. McCone, Roosevelt, and Richland Counties) many of these sites were subsequently destroyed due to cultivation, did not apparently establish or until recently did not appear to have spread. The wide spread distribution of *Aceria malherbae* may indicate that the mite may be wind dispersed to a greater extent than was previously thought (perhaps originating from Yellowstone Co.). Despite the mite being widespread, its current impact on field bindweed appears to be low in many places. Yellowstone County appears to have the highest density of *Aceria malherbae* compared with other Montanan counties. Perhaps with time, the mite may reach comparative levels.

Table 1. *Aceria malherbae* sample locations - Montana 2007

<b>County</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Presence</b>	<b>Mite Level</b>	<b>Elevation</b>
Big Horn	Hardin	N 45 44.537	W 107 36.606	Y	1	2855
Carbon	Bridger	N 45 15.838	W 108 52.736	Y	3	3745
Carbon	Edgar	N 45 27.843	W 108 51.791	Y	1	3487
Custer	Diamond Ring Ranch	N 46 36.989	W 105 32.309	Y	3	2367
Daniels	Scobey	N 48 47.083	W 105 25.095	Y	1	2475
Dawson	East of Prairie Co. line - rest stop	N 46 53.968	W 105 01.165	Y	1	2252
Dawson	West of Wibaux Co. line	N 47 02.779	W 104 23.508	Y	1	2614
Fergus	191 & Birdwell Rd	N 47 28.876	W 108 45.083	Y	1	3079
Fergus	Bohemian Corner	N 47 21.387	W 108 48.294	Y	1	3246
Fergus	North of Roy	N 47 27.479	W 108 52.097	Y	1	3117
Fergus	North of Roy	N 47 27.102	W 108 53.243	Y	1	3129
Fergus	North of Roy	N 47 26.778	W 108 53.251	Y	1	3115
Fergus	North of Roy	N 47 29.086	W 108 53.312	Y	1	3073
Fergus	North of Roy	N 47 28.080	W 108 53.360	N	-	3100
Fergus	North of Roy	N 47 24.890	W 108 54.596	Y	1	3191
Fergus	North of Roy - Release 1994/95	N 47 26.634	W 108 54.395	Y	2	3138
Fergus	Roy	N 47 26.418	W 108 54.400	N	-	3479
Flathead	Kalispell	N 48 12.455	W 114 19.626	Y	1	2979
Gallatin	Belgrade	N 45 46.311	W 111 10.116	Y?	1	4468
Gallatin	Bozeman	N 45 41.300	W 111 02.563	N	-	4777
Gallatin	Bozeman	N 45 41.335	W 111 02.625	N	-	4777
Gallatin	Bozeman - MSU	N 45 40.199	W 111 03.308	Y	1	4840
Gallatin	Bozeman - MSU	N 45 40.272	W 111 03.318	N		4849
Gallatin	Manhattan	N 45 51.392	W 111 19.873	N	-	4260
Gallatin	Manhattan	N 45 51.455	W 111 20.067	N	-	4270
Gallatin	Springhill	N 45 52.494	W 111 03.721	N	-	4744
Gallatin	Springhill	N 45 52.138	W 111 03.641	N	-	4643
Gallatin	Springhill	N 45 51.639	W 111 03.715	N	-	4623
Garfield	Rest Stop - Garfield/ McCone Line	N 47 19.508	W 106 10.263	Y	1	2468
Lewis & Clark	East Helena	N 46 35.271	W 111 55.053	Y	1	4261
McCone	North of Vida - Near Jct 13 & 201	N 47 53.850	W 105 23.636	Y	2	2418
Park	East of Livingston - Mission Rd	N 45 42.859	W 110 24.012	N	-	4359
Park	East of Livingston - Yellowstone River	N 45 42.993	W 110 27.967	N	-	4422
Park	East of Springdale Fishing Access	N 45 42.088	W 110 15.665	Y	1	4303
Park	Livingston - Release	N 45 42.243	W 110 31.834	Y	1	4579
Park	Springdale Exit - I 90	N 45 44.294	W 110 12.875	Y	1	4162
Phillips	CMR - Release 2001	N 47 36.368	W 108 30.228	Y	1	2277
Phillips	CMR - Release 2006	N 47 36.524	W 108 30.226	Y	2	2270

Phillips	CMR - Release 2006	N 47 36.585	W 108 30.285	Y	1	2274
Prairie	Terry	N 46 47.462	W 105 18.193	Y	1	2304
Prairie	Terry	N 46 47.095	W 105 18.158	Y	1	2284
Richland	Crane - Seven Sisters WMA	N 47 34.437	W 104 14.966	Y	1	1990
Richland	Savage - Elk Island WMA Rd	N 47 27.844	W 104 20.518	Y	1	1992
Richland	West of Lambert - Release	N 47 49.128	W 104 49.332	Y	1	2434
Roosevelt	North of Wolf Point - Rt 13	N 48 29.225	W 105 25.846	Y	2	2416
Rosebud	East of Rosebud	N 46 15.685	W 106 16.814	Y	3	2530
Rosebud	Hathaway	N 46 16.565	W 106 11.760	Y	1	2487
Rosebud	West of Forsyth	N 46 15.616	W 107 08.287	Y	1	2697
Stillwater	Columbus	N 45 38.590	W 109 14.895	Y	3	3606
Stillwater	East of Columbus - Molt Rd	N 45 37.781	W 109 12.029	Y	1	3805
Stillwater	Park City	N 45 38.187	W 108 54.916	Y	1	3400
Stillwater	West of Columbus - Springtime Rd	N 45 42.097	W 109 23.298	Y	1	3707
Stillwater	West of Park City	N 45 36.784	W 109 00.475	Y	1	3432
Sweetgrass	Big Timber	N 45 49.611	W 109 58.420	N	-	4036
Sweetgrass	Greycliff - Pelican Fishing Access	N 45 45.476	W 109 46.216	Y	1	3896
Sweetgrass	Reed Point	N 45 42.341	W 109 32.475	Y	2	3760
Treasure	West of Hysham	N 46 13.031	W 107 15.039	Y	1	2895
Valley	East of Opheim	N 48 51.191	W 106 23.511	Y	3	3250
Wibaux	East of Dawson Co. line	N 47 08.576	W 104 18.414	Y	1	2840
Wibaux	West of ND state line	N 47 56.427	W 104 04.405	Y	1	2826
Yellowstone	Billings - River Front Park	N 45 44.477	W 108 32.400	Y	2	3176
Yellowstone	Billings - Zoo Ave.	N 45 44.068	W 108 36.609	Y	2	3268
Yellowstone	Custer	N 46 07.765	W 107 33.436	Y	1	2740
Yellowstone	East of Billings - 190 & 94	N 45 48.998	W 108 24.801	Y	2	3134
Yellowstone	East of Laurel	N 45 41.026	W 108 42.340	Y	1	3280
Yellowstone	Huntley - East of Museum	N 45 55.907	W 108 13.669	Y	3	3008
Yellowstone	Huntley - Museum	N 45 55.630	W 108 14.324	Y	2	3033
Yellowstone	Huntley - Release (?)	N 45 53.203	W 108 18.726	Y	1	3039
Yellowstone	Huntley - River	N 45 53.328	W 108 18.819	Y	1	3065
Yellowstone	Pompey's Piller	N 45 59.229	W 108 00.283	Y	1	2897
Yellowstone	Pompey's Piller - Visitor Center	N 45 59.621	W 107 59.963	N	-	2905
Yellowstone	South of Huntley - Hogan Rd	N 45 49.202	W 108 17.366	Y	1	3160
Yellowstone	South of Huntley - Shadow Canyon	N 45 50.707	W 108 17.847	Y	1	3130
Yellowstone	South of Laurel - BLM release 2003	N 45 38.540	W 108 44.884	Y	1	3274
Yellowstone	Worden	N 45 57.594	W 108 09.728	Y	3	3050
Yellowstone	West of Huntley	N 45 52.445	W 108 19.857	Y	1	3133
Yellowstone	West of Custer	N 46 03.793	W 107 42.527	Y	3	2968